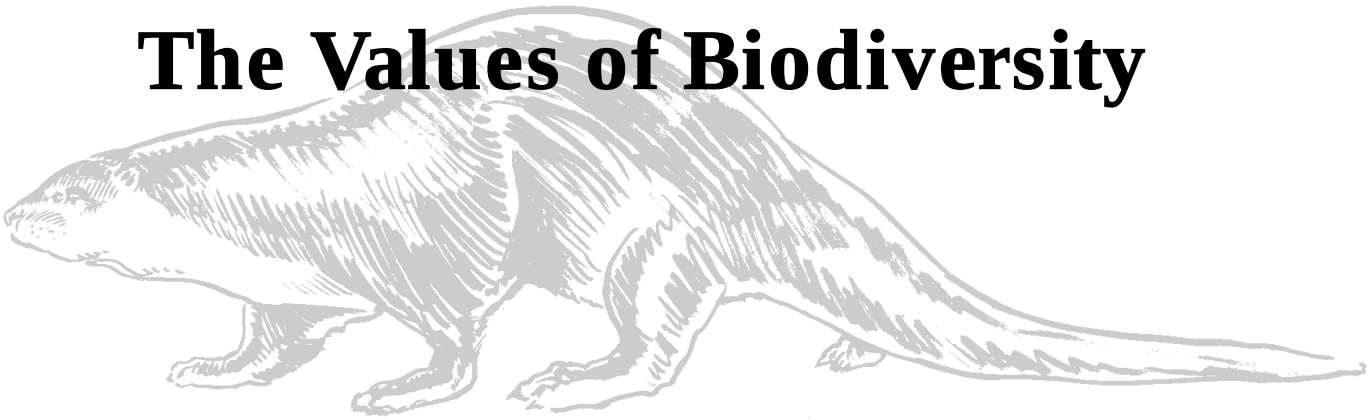
Chapter 2

The Values of Biodiversity



2.1 Overview of the values of biodiversity

2.1.1 Biodiversity conservation as a global concern

Understanding the full value of biodiversity in the region is required in order to evaluate this plan's recommendations. Unfortunately, it is difficult to develop and apply neat economic measures for the current and future value of the region's biodiversity to its citizens. In addition, attempting to justify biodiversity conservation only in terms of its utilitarian benefits to people will inevitably underestimate its true value. There is, however, a wide range of recognized values of biodiversity, deriving from biodiversity at both the local and global levels. A strong case can be made not only that conservation of biodiversity makes good economic sense but also that it is important to the region's citizens in ways that go beyond adequate economic measures. This chapter outlines the various values associated with biodiversity and evaluates some of the costs and benefits of conservation actions in Chicago Wilderness.

The rapid decline of biodiversity around the world is a policy issue of major global concern. At the Earth Summit in Rio de Janeiro in 1992, most of the governments of the world signed a global Convention on Biological Diversity. By 1993, enough nations had ratified the Convention that it entered into force as international law. The Convention recognizes the conservation of biodiversity as a "common concern of humankind," due to its intrinsic values and its importance to people. The Convention asserts that governments are responsible for conserving their biological diversity and using biological resources in a sustainable manner.

While the connection between the region's forest preserves and parks and the lofty ideals of an international convention may seem slim, in fact, what we conserve here has direct bearing on the preservation of global biodiversity. Further, and more important, the loss of biodiversity and its associated values that motivated the nations of the world to develop the Convention is occurring right here in the Chicago region. The people who live here stand to lose as much as the people of tropical rainforests or old-growth forests.

2.1.2 The range of values of biodiversity

Direct-use values

Economists and biologists who measure the value of biodiversity categorize those values by how people benefit from them. In one such category are direct-use values, where people directly consume or use species for their benefit. Most of the significant direct-use values are associated with the great store of global biodiversity. These include the values of natural products for developing pharmaceuticals, for developing and maintaining the genetic basis for agriculture, and for supporting industries based on use species such as fisheries and timber extraction. (For more discussion, see World Resources Institute et al. 1992.) While most of these industries are not based directly on species in Chicago Wilderness, scientists recognize that it is the global store of biodiversity, to which Chicago Wilderness contributes, that maintains options for the future for these and other major economic activities. With the growth of the use of biotechnology, the economic value of genetic material from natural sources is likely to rise.

Ecosystem services

In a second major category of value associated with biodiversity are indirect values provided by ecosystem services. Ecosystem services are the conditions and

processes through which natural ecosystems, and the species that constitute them, sustain and fulfill human life (Daily 1997). We could not survive without the basic services provided by natural systems. These include primary conversion of sunlight to energy, nutrient cycling and retention, recycling of organic wastes, soil formation, moderation of climate extremes, moderation and control of flood damage, control of insect pests, protection of water quality, and pollination of crops (Sullivan 1997, Daily 1997).

The link between ecosystem services and biodiversity is not always easy to demonstrate. While ecological theory predicts that biodiversity should be linked to improved ecosystem function, research at an ecosystem scale with appropriate controls is difficult to conduct. Some critics may argue that any green plant can fix carbon dioxide through photosynthesis, and that non-native species can play many of the roles that native species once played. While this is true to a limited degree, a review of available research indicates that many aspects of the stability, functioning, and sustainability of ecosystems depend on biodiversity (Mooney et al. 1995, Tilman 1996, Tilman et al. 1996). The conservation and management of natural areas that maintain diverse woodlands, prairies, and aquatic systems will help assure the sustained production of ecosystem services.

While life as we know it could not continue without these ecosystem services, their value can be considered infinite. However, it is possible to estimate the value they provide directly to our economy and the cost of replacing them with human-made substitutes. As a very rough approximation, economists have estimated that the value of ecosystem services and natural capital at the global level is $33 trillion per year, or approximately twice the global gross national product (Constanza et al. 1997). In the United States, Pimentel et al. (1997) estimate the annual economic benefits of ecosystem services at approximately $300 billion.

These global and national studies are difficult to directly connect to loss of biodiversity at the local level. Nonetheless, they do indicate that biodiversity is likely being grossly undervalued as we continue development patterns that lead to its loss. At the local level, we can measure some of the obvious costs associated with the past loss of natural areas and biodiversity. Flooding on the Des Plaines River alone costs local governments and property owners $20 million in an average year. In the late 1980s, two floods caused an estimated $100 million in damage (Illinois DNR 1998). Flooding in the region is directly associated with the loss of wetlands and other natural areas in the watershed that served to trap rainfall and store it, rather than dumping it in the river. Another measure of the same problem is the cost associated with developing human-made solutions to the problem. The Tunnel and Reservoir Plan, known as the Deep Tunnel, of the Metropolitan Water Reclamation District, is a multi-billion dollar undertaking to collect excess runoff and treat it before releasing it into waterways. These are the services that once were provided more extensively by prairies, woodlands, and wetlands.

Recreation and aesthetics

Important factors in calculating the value of biodiversity are the recreational use of natural areas and the value that people place on natural systems for aesthetics and as part of the cultural heritage. Not only are the protected lands that constitute Chicago Wilderness of global significance for biodiversity, but they are also of enormous value for the quality of life of the region's citizens. Public use of the forest preserves is staggering, with an estimated 40 million annual visits to Cook County lands alone (Forest Preserve District of Cook County 1994). In Lake County in 1998, 75% of residents reported visiting a forest preserve within the previous two years, with hiking the most common use (Richard Day Research 1998). Active nature-based activities enjoyed by millions of the region's residents include hiking, bird watching, fishing, and photography. In 1996, more than 3 million people reported engaging in wildlife watching in Illinois, contributing an estimated $1.6 billion to the economy (U.S. Fish and Wildlife Service and U.S. Bureau of the Census 1998).

The high levels of use of the region's natural areas indicate the importance of these areas and their biodiversity to the quality of life in the region. The attractiveness of the region as a place to live and work is also a critical factor in its future economic competitiveness (Johnson 1999). Healthy natural areas are the key for biodiversity, and they provide unparalleled opportunities for the outdoor recreation that millions of people in the region want.

Non-use values

A final type of value associated with biodiversity, and a type harder to quantify, is non-use value. This includes feelings of ethical obligation to protect other species from extinction, religious values associated with cherishing the Earth and its inhabitants, and the desire to leave for future generations that which we are able to enjoy. In some ways, these concerns are the core motives for protecting biodiversity. A national survey of public attitudes about biodiversity, a survey that included focus groups in Chicago, found that responsibility to future generations and a belief that nature is God's creation were the two most common reasons people cited for caring about conservation of biodiversity (Biodiversity Project 1998).

The importance of one's natural heritage cannot be estimated in dollars. Nonetheless, there is value in the sense of discovery that comes to each new generation as it

learns the essential facts of what came before. If that history includes a richness of color, shape, and form, so much the better. The people of this region can learn to treasure remnant prairies, forests, lakes, and streams just as they have learned from their parents and others to treasure their cultural heritage of language, art, architecture, music, and religion.

2.2 Issues in evaluating the costs and benefits of protecting biodiversity

2.2.1 Protecting a public investment already made

This region has already made a substantial investment in preserving open space and in abating pollution in streams, rivers, and lakes. Sadly, these investments vary in their utility for sustaining biodiversity. In fact, natural communities are generally still declining, even on publicly owned, protected sites and in local streams and lakes. This is partly because the importance of biodiversity, and the means of preserving it, was only dimly understood when many of these public investments were made.

Investments in public open space helped protect natural communities from total destruction, but absent the measures called for in this plan, those investments will steadily lose their value. For example, 100 years ago it was a simple matter to walk through woodlands and, except in winter, enjoy flowering native plants. Today, the invasion of exotic plants such as buckthorn coupled with excessive grazing by deer make the same woodlands less accessible and much less appealing during most of the year.

Major investments have provided an important foundation for protecting the aquatic environment, including biodiversity, but much remains to be done. Public investments in wastewater treatment plants were intended to insure clean streams and lakes throughout the region, but other sources of pollution still prevail and even the modern local treatment plant can have adverse impacts on delicate and high-quality aquatic habitats.

Thus, a pragmatic argument for preserving biodiversity is that it protects and enhances the value of large public investments already made in public land and facilities.

Agencies seeking property for permanent open space, with traditional goals of outdoor recreation and conservation, will often find they can protect sites with biodiversity values at little or no additional cost. However, protecting lands only for recreational purposes will not suffice to protect biodiversity in the region or the full range of values it provides.

2.2.2 High replacement costs

One approach to placing a value on a natural community is to calculate its replacement cost. Much of this region's original flora and fauna and their corresponding habitats can be considered rare, a factor that normally influences the price of any commodity.

Consider whether it is even possible to replace the two most characteristic landscapes found in the region prior to European settlement: tallgrass prairies and wetlands in their various forms. Those few remnants that are in something close to original condition are rare indeed, making up less than one percent of the region's landscape. And though much has been learned about how to restore or replicate original prairies and wetlands, efforts thus far have been less than fully successful. The measures of success for such replications include both their natural sustainability and the extent of their biological diversity. To date, even the best manmade wetlands and prairies have fallen short, especially by the yardstick of species diversity. While this plan recognizes that restoration of degraded habitats can go a long way toward returning and protecting the values associated with the region's biodiversity, it recognizes that the costs of doing so are far more than protection would cost in the first place. Hence, protection of the region's remnant natural areas can be viewed as a prudent economic measure.

2.2.3 Value of competing uses

Although our remnant natural communities may be irreplaceable, the market value of the sites they occupy will often be dictated by what they can command on the private market for such purposes as residential or commercial development. Fortunately, at least some types of natural areas or habitats have not been considered highly suitable for suburban development or farming. These have included floodplains, some rural wetlands, and fragmented sites such as those found along rail lines. A good example is the floodplain of the Des Plaines River in both Cook and Lake Counties, much of which is now in forest preserves.

Conversely, lake and riverfront property not subject to flooding and sites with mature trees are often highly valued for urban development. Thanks to the foresight of previous generations, the tradition of preserving at least some of these most attractive sites for public use has been well established. The best example is the extensive shore-

line of Lake Michigan in Chicago, which is largely in public ownership if not in its original, natural state. Another outstanding example is the greenway extending along most of the Fox River in Kane County. These two cases demonstrate that, in the public's mind, the preservation of important open space competes favorably with even the most expensive private development.

2.2.4 Costs of land acquisition

The two principal costs that would result from this plan's recommended actions are for further land acquisition and for increased site management. It is not possible to determine the exact costs of future acquisition because no exact target has been set and because prices will change over time, generally upward, as further suburban development takes place.

In the spring of l999, three of the member counties conducted successful referenda on acquiring additional open space. Together, the three counties won authorization to spend up to $175 million to acquire an estimated 15,500 acres.

Both federal and state grants are expected to be available to assist local agencies in their land acquisition efforts. Existing and potential grant programs are discussed in Chapter 11 of this plan. Land preservation by less than fee-simple acquisition can also reduce costs. Various land preservation techniques are described in Chapter 8.

The preservation and enhancement of biodiversity also involves lands that remain in private ownership. In such cases, there is little or no acquisition cost to the public.

2.2.5 Costs of managing lands and waters

The dollar costs of managing natural areas to sustain biodiversity vary with the type and condition of the site and with the availability of volunteers. These costs will also vary according to the phase or stage of restoration achieved. For example, the initial or remedial phase may last three to five years and cost substantially more than subsequent annual maintenance.

A consultant's report to the DuPage County Forest Preserve District prepared in 1995 estimated that the ten-year costs for restoring and maintaining the County's natural areas to good ecological condition would be about $20 million. The authors qualified their estimate by stating that it assumed no innovation or streamlining of processes for remediation and maintenance over a ten-year period. Two effective means of lowering management costs are to use volunteers as part of the management program and to protect and manage larger areas. The cost of not properly managing these same natural areas was suggested by the finding that 80% of the county's natural areas had declined to poor health since they had been originally studied 15–20 years earlier (Applied Ecological Services, Inc. 1995).

Lakes, streams, rivers, and wetlands can also be managed in various ways or left unmanaged. Traditionally, managing streams and rivers meant channelizing, dredging, and building various structures such as dams. This type of management carries a high initial price tag and high costs for maintenance and repair, yet it provides fewer benefits than management techniques that replicate natural processes. When streams and rivers are managed in ways consistent with the goal of sustaining and enhancing biodiversity, the benefits can include improved aesthetics, reduced flooding and flood damage, reduced soil erosion and sedimentation, improved fishing and other recreation opportunities, and the reduction of invasive, non-native species. These alternative methods also carry a smaller initial price tag and require less annual maintenance expenditure (Northeastern Illinois Planning Commission 1998).

Some sites will require substantial restoration efforts to sustain or improve biodiversity. While each case is apt to have unique aspects, many successful projects to restore lakes, wetlands, and prairies have already been undertaken within the Chicago Wilderness area, and the land-management agencies in the region can help provide general cost information.

2.2.6 Evidence of public support

Is maintaining biodiversity worth the cost? Both national and local surveys consistently suggest that most people think so. A study by the Brookings Institution reported that 72% of the referenda on the nation's state and local parks and conservation won voter approval in November of 1998. These measures will trigger an additional $7.5 billion in state and local conservation spending (Myers 1999).

The passage of three local county referenda allocating funds for land acquisition and management in the spring of l999 serves as the most recent direct evidence of public support for spending public dollars to increase protection of natural areas. The percentages of voters approving by Illinois county were: Kane County–65.6%; Lake County–65.8%; and Will County–57%.

Two years earlier, a $75 million referendum on behalf of the DuPage County Forest Preserve District passed by a margin of 57.4 to 42.6 percent.

Neither the Cook County Forest Preserve District nor the McHenry County Conservation District has held referenda in recent years. However, other evidence suggests that citizens in these counties would also support further efforts to preserve and restore natural areas. For example, in the fall of 1998, the American Farmland Trust sponsored a study of public attitudes pertaining to farmland and open space preservation in Kane, McHenry and DeKalb Counties (Krieger 1999). Among the findings were the following:

- Buying open space to protect it from development ranked equal to spending for improved law enforcement, crime reduction, and schools, and it ranked significantly higher than spending for roads, libraries, and more public recreational facilities.
- Of the actions offered to protect open space, enlarging forest / prairie preserves and wetlands / marshes far outranked buying farmland development rights or building more hiking / biking trails, more state parks or local park district parks, or more golf courses.
- The most common reason cited for valuing protection of open space was wildlife habitat.

In a l996 survey sent principally to residents of Cook County, more than 90% percent of the respondents said restoration of natural areas in around Chicago was good and beneficial (Barro and Bright 1998).

Finally, Chicago Wilderness sponsored its own survey of the public's willingness to spend public funds on behalf of biodiversity restoration. Kosobud (1998) summarizes the results:

> *The survey of a carefully selected, non-random sample of residents revealed a significant willingness to pay for new wilderness recovery and extension activities. The personal interviews were carried out in a manner to acquaint the respondent with the topic and to prepare the respondent for a thoughtful answer. The sample mean willingness to pay was a $37.80 per year increase in annual property tax payment, or equivalent increase in rent, all accruing to the appropriate government agencies for this effort. The mean adjusted for the non-random sample was $19.67. Applied to the close to 3 million households of the region, this estimate indicates that up to 59 million dollars per year could become available for land acquisition, soil preparation, weeding, seeding, maintenance, and other measures. A public well informed about such activities is an essential prerequisite for such a projection.*